Semiannual Progress Report for Cooperative Agreement: 68-7482-12-504

Submitted to Charlie Rewa and Christopher Watkins
USDA NRCS

Reporting period: April 1, 2012- September 30, 2012

Submitted by Scott P. Sowa and John Legge
The Nature Conservancy

October 20, 2012

1. General Report of Progress

We made significant progress on all four objectives of the Western Lake Erie Basin (WLEB) CEAP project during this first six month period. Our initial focus was on effective project management. The WLEB CEAP is an extremely complex project in terms of scope, technical difficulty, number of partners, and decentralized location of staff working on the various projects and tasks. It consists of three complimentary projects being led by; a) The Nature Conservancy (TNC); b) USDA Agricultural Research Service (ARS); and c) The Ohio State University (OSU) and Ohio Sea Grant (OSG). To effectively manage this large and complex project we developed an overarching work plan that binds all three of these projects together and provides a common understanding of roles, responsibilities and relationships among the projects and the staff. The team has also put in place two additional approaches for managing this project, including a) a system of monthly conference calls for overall project tracking that includes all of the project partners and b) an on-line project communication site through TNC's intranet, which is called Connect. Also based on recommendations by key resource professionals that we should not develop yet another advisory panel for this region we met with WLEB Partnership who agreed to serve in an advisory capacity for our project.

As for progress on the more technical objectives, we are nearly complete with obtaining the water quality data for helping with the calibration and validation of the downscaled SWAT model. We have obtained fish and macroinvertebrate data from all three states (IN, MI, and OH) and begun processing to ensure the quality and facilitate the integration of these data into a single dataset. We have also recently found out about efforts to clean and integrate biological datasets in Ohio that will likely save us valuable time and allow us to focus more on the processing of the data for MI and IN. SWAT model input data sets, at the 12-digit scale, have been developed for the entire WLEB and the model is operational. Maps of the NHDPlus catchments have been assembled and will be used as "routing units" within the 12-digit subbasins. The routing units are a new development in SWAT and allow channel routing at the NHDPlus level while maintaining HRU development at the 12-digit level, thus allowing feasible computational efficiency. The current CEAP croplands calibration procedure is being refined to allow more stream gages and also to ensure that processes including sediment yields and delivery, subsurface

flow and nitrate yields, and nutrient balances are realistic and included in the calibration processes.

Finally, we continued to explore options for further integration of products developed under the Wildlife component of CEAP into other CEAP or NRCS assessment and planning efforts. Specifically, we held a two day meeting in Beltsville, MD, on September 18th and 19th, focusing on the evolution, progress, products, and future of the Missouri River, Great Lakes, and Western Lake Erie Basin CEAP Efforts. A primary focus of this meeting was how to integrate the products of these various CEAP efforts into the ongoing assessment and planning efforts and associated decision tools like the Vulnerability and Assessment Program Performance Tool VAPPT At the meeting NRCS staff, responsible for building the VAPPT tool, were able to directly integrate some of the resulting geospatial products as part of the Missouri River CEAP effort. This direct integration was the first step to successfully demonstrating our ability to incorporate biological endpoints (and the products of the Wildlife Component of CEAP) into NRCS program planning and assessment.

2. Comparison of Actual and Proposed Accomplishments

Major Objectives, Tasks and Progress to Date

Objective 1: Develop fine resolution SWAT models for WLEB

Task 1.1: Compile water quality and flow data to support the spatially-distributed calibration of the WLEB SWAT model and deliver it to the ARS SWAT Modeling Team: ***Due Aug 30, 2012***

We are slightly behind on meeting this objective, but we have made significant progress in the last few weeks. We have downloaded the long term fixed-station water quality data from Heidelberg University and have begun to process these data. We have also acquired extensive water quality data from the US EPA STORET website for each state and have begun processing these data as well. In addition, we are in the process of acquiring data from Ohio EPA (OEPA) that was not submitted to STORET. These data come from Ambient Monitoring Stations and Total Maximum Daily Load (TMDL) surveys, which do not exist in a master database and must be acquired in portions through special requests and downloads from OEPA's website.

We have also had very promising conversations with Dale Robertson from USGS (developer of the SPARROW model) about the potential to acquire the calibration data that was used to calibrate the SPARROW modeling for Western Lake Erie. This data would allow us to avoid duplicating the same effort to calculate loads for locations with sufficient water quality and flow data. In addition, Dale would like to continue to engage with our group, which would help in thinking through calibration issues (since he has been working on this) and could significantly help us with our interest in integrating the complimentary best qualities of the SWAT and SPARROW models. There are a few decisions that the team needs to make with regard to what data we want (e.g. calibration time period, load calculation approach), in discussion with Dale Robertson, before officially requesting these data from USGS. More specifically, the content,

format and suitability of these data for improving the downscaled SWAT model needs to be reviewed and approved by ARS and we have had initial conversations toward that end.

Task 1.2: Compilation of data for defining HRUs, input and calibration data for SWAT, tiling and atrazine data, SPARROW data: ***Due December 30, 2012***

From USDA ARS: SWAT data sets at the 12-digit scale have been developed for the entire WLEB and the model is operational. We are focusing on the development of the SWAT management files and have developed management input files that include crop rotations, tillage, fertilizer and pesticide application rates from the RUSLE2 data set. We are currently in the process of incorporating structural practices (buffers, grass waterways, contouring, etc.) from CEAP survey data and subsurface drainage information from USGS data sources. Maps of the NHDPlus catchments have been assembled and will be used as "routing units" within the 12-digit subbasins. The routing units are a new development in SWAT and allow channel routing at the NHDPlus level while maintaining HRU development at the 12-digit level, thus allowing feasible computational efficiency. Calibration data used in the CEAP croplands project has been assembled and additional flow and water quality data from Heidelberg College is being processed into proper form for direct SWAT calibration.

Task 1.3: Set up and calibration of WLEB SWAT model. ***Due April 30, 2013***

From USDA ARS: The current CEAP croplands calibration procedure is being refined to allow more stream gages and also to ensure that processes including sediment yields and delivery, subsurface flow and nitrate yields, and nutrient balances are realistic and included in the calibration processes. Current calibration procedures focus on optimizing statistics at stream gages but do not ensure that sediment and nutrient balances are realistic within the watershed. The new procedures under development will optimize comparison statistics at gage sites and also ensure that the processes within the landscape are reasonable.

Task 1.4: Use SWAT to predict historic and current water quality and flow conditions for stream reaches across WLEB. ***Due July 30, 2013***

From USDA ARS: No Progress.

NOTE: Task 1.4 is a year 2 task but is included in this year 1 report to provide context and continuity for the other tasks and objectives.

Objective 2: Develop models that predict selected riverine biological endpoints based on SWAT output variables and other relevant watershed and local catchment variables

Task 2.1: Compile available biological data (Fish and Inverts) for WLEB and spatially link it to the NHD-Plus: *Due October 30, 2012*

Michigan Data

We have obtained fish community data from the Michigan Rivers Inventory and macroinvertebrate data from the Michigan Department of Environmental Quality. We have also initiated a data request to the Michigan Department of Natural Resources to obtain fish community data for Lake Erie tributaries from the Fisheries Division resource inventory programs (e.g., Status and Trends survey, management evaluations, and discretionary surveys). We are still waiting to hear back from Michigan DNR on their ability to accommodate our data request.

Indiana Data

The Nature Conservancy requested data from the Assessment Information Management System (AIMS) of the Indiana Department of Environment Management, Office of Water Quality Assessment Branch, including georeferenced point data on nutrient, sediment and flow parameters. These data are maintained in IDEM's:

- Fixed Station (Ambient) Water Monitoring Program
- Fish Community Sampling Program
- Macroinvertebrate Community Sampling Program

These include biological and habitat metrics like percent omnivores or percent ephemeroptera and riparian condition, as well as, the resulting multimetric indices for Fish: Index of Biotic Integrity (IBI), Macroinvertebrates: Invertebrate Community Index (ICI), and Stream Habitat: Qualitative Habitat Evaluation Index (QHEI). IDEM is currently determining the scope of our request and we expect the data to be provided by the end of October. The next step is to review the data format and content, determine suitability, and deliver it to the ARS.

Ohio Data

The Nature Conservancy requested and obtained biological data from the Division of Surface Water, Ohio Environmental Protection Agency (OEPA), including georeferenced point data on fish and macroinvertebrates. However, just recently Stu Ludsin, from The Ohio State University (OSU), made contact with a colleague (Brian Zimmerman) at OSU's Museum of Biological Diversity who has been working hard on cleaning up these same data and integrating them with the OSU Fish Collection dataset. Based on these recent conversations it appears that we can get a complete and semi-clean OEPA fish dataset (through 2011) from Brian Zimmerman right now, or perhaps wait a bit longer and get a fully cleaned OEPA-OSU Museum dataset (and fish distribution maps). This decision will be a point of focus for our next team call.

Task 2.2: Compile existing data on other watershed and local catchment factors that influence selected biological endpoints. ***Due December 30, 2012***

During this project period we requested and received the Great Lakes Basin Fish Habitat Partnership's (GLBFHP) regional dataset from Randy Claramunt (MIDNR) and from the contractor Down Stream Strategies. This is new data that just became available. The data is compiled on the 1:100K NHDPlus stream and catchment framework and consists of a number of anthropogenic and natural variables quantified at the NHDPlus catchment level (see table below). There is additional data consisting of a large river species index, lithophilic species index, walleye, brook trout, and coldwater species index. Finally, there are predicted values for the relative occurrence or abundance of each of the modeled fish species, as well as the calculated natural habitat potential and anthropogenic stress within each NHDPlus catchment, 8-digit HUC, and 12-digit watershed. We have also requested, though not yet received, the entire Great Lakes Basin Aquatic Gap data set from Jana Stewart (USGS). Once all of these data are in hand they will be transferred to the NHDPlus framework, as they currently are geographically referenced to a customized stream network that was built from the NHDPlus.

GLBFHP Variables (basic categories)	
Land use/Land cover	Precipitation
Soil	Temperature
Bedrock geology	Stream temperature
Wetlands	Landform
Point source contamination	Road crossings
Nonpoint source contamination	Dams
Groundwater use	Mines
Surface water use	Cattle density
Slope	Population density
Elevation	Nutrient loading

Task 2.3: Integrate all of the predictor and response variables into a common baselayer: NHD-Plus dataset. ***Due April 30, 2013***

No work has been done on this task, except that as part of Tasks 2.1 and 2.2 we are actively seeking biological and habitat data that have already been linked to the 1:100K NHDPlus.

Objective 3: For priority subwatersheds of WLEB, model and map predicted changes in water quality, flow, and biological endpoints resulting from selected conservation scenarios.

Objective 3 is not applicable to the first year of this multi-year project.

Objective 4: Develop and implement effective communication and collaboration strategies for the WLEB CEAP project

Task 4.1: Develop and implement an effective overarching project management strategy: ***Due August 30, 2012***

The WLEB CEAP is an extremely complex project in terms of scope, technical difficulty, number of partners, and decentralized location of staff working on the various projects and tasks. To address this complexity we developed an overarching work plan that binds all three "sister projects" together and provides a common understanding of roles, responsibilities and relationships among the projects and the staff (Attachment A). At TNC we also developed a more detailed work plan for our specific set of tasks that we are responsible for on this grant agreement which provides another level of detail project management needed to provide clarity on roles and responsibilities.

The team has also put in place two additional approaches for managing this project and ensuring that the tasks and deliverables of all the partners and complimentary project that are laid out in Attachment A are being completed on time. First, we have established a system of monthly conference calls for overall project tracking including all of the project partners. On each call, we are reviewing progress on all of the active deliverables for the project. So far this has enabled us to catch certain activities that were falling behind schedule and resume timely progress. It has also provided a forum for sharing resources such as data needs for different parts of the project. The calls are scheduled for the second Wednesday of the month, at 10 a.m. Eastern time.

Second, we have established an on-line communication site through The Nature Conservancy's intranet, which is called Connect. The Connect system allows us to establish project-specific on-line spaces for document sharing, calendars, and other items, and it also allows us to invite non-Conservancy partners to use a specific project site. We have established a Connect project site for the WLEB CEAP project, which has currently been used for developing this report. We are in the process of providing access to the site the non-Conservancy project partners. The site will be invaluable to us for collaboration and communication through the remainder of the project.

Task 4.2: Develop and participate in WLEB CEAP Advisory Panel: Establish panel and first meeting date. ***Due September 30, 2012***

As we began to explore options for forming an Advisory Panel we had numerous discussions with potential panel members who stated that there are too many advisory panels for this region already and that we would be wise to explore options for using the Western Lake Erie Basin (WLEB) Partnership as our advisory panel. This led to discussions WLEB Partnership meeting planning staff who agreed to serve in this advisory capacity for our project. So, the WLEB Partnership, or a yet to be determined subcommittee, will be considered the WLEB CEAP Advisory Panel.

The roots for the WLEB Partnership were established when the U.S. Army Corps of Engineers (USACE) and the U.S. Department of Agriculture – Natural Resources Conservation Service (NRCS) invited 14 Federal, State, and regional partners to attend the meeting in Defiance, OH on November 7, 2005. This was the first meeting of what was considered the Leadership Group designed to create a comprehensive watershed management partnership and framework for the USACOE's WLEB Study. The WLEB Partnership was officially established on March 29, 2006, when the WLEB Charter was agreed to and the signatories agreed to develop a consensus-based Partnership to pursue the following principles:

- The Partnership is committed to collaboration and consensus building – sharing resources and knowledge to link land use to water quality, support ongoing efforts and identify new opportunities to enhance and improve the watershed.
- The Partnership is committed to collaboration and consensus building – sharing resources and knowledge to link land use to water quality, support ongoing efforts and identify new opportunities to enhance and improve the watershed.
- The Partnership will apply watershed-based solutions to local problems and apply local solutions to watershed problems -inclusively empowering and building the capacity of local watershed groups and supporting ongoing efforts.
- The Partnership is results oriented – it will define the baseline status of the basin, identify and prioritize science based solutions, responsibly support the implementation of innovative and cooperative projects, monitor and evaluate its actions and support an adaptive management approach.
- The Partnership will speak with one voice, promote transparency, encourage participation, be responsive, create awareness, educate and inform.
- The Partnership will provide the structure necessary to coordinate public and private resources across political boundaries to accelerate achievement of environmental goals and support for local conservation initiatives.

More information on the WLEB Partnership members and activities can be found online at: http://www.wleb.org/wordpress/

Task 4.3: Organize and host WLEB CEAP Advisory Panel Meetings. ***Ongoing meetings every 4-6 months***

Our first meeting with the WLEB Partnership will be held in December 2012. After that initial meeting we will meet every six months, following the WLEB Partnership's meeting schedule.

Task 4.4: Participate on the National Expanded CEAP Team. ***Due September 30, 2012, but ongoing***

We have established regularly scheduled monthly meetings between NRCS, ARS, TNC, OSU, and Ohio Sea Grant staff to not only help manage the overall Western Lake Erie Basin CEAP project, but also to discuss opportunities for further integration of the Cropland, Wildlife and Watershed components of CEAP. So far we have held two conference calls, on September 12th

and October 10th, that have focused mostly on the WLEB CEAP project, but also good discussion on how to incorporate some of the past and ongoing CEAP Watershed Studies occurring in Western Lake Erie into our project and also the continued discussion on how best to incorporate biological endpoints into the Cropland component of CEAP.

We also held a two day meeting in Beltsville, MD, on September 18th and 19th, focusing on the evolution, progress, products, and future of the Missouri River, Great Lakes, and Western Lake Erie Basin CEAP Efforts. This meeting had representatives from NRCS, TNC, and the University of Missouri (see list below). A primary focus of this meeting was how to integrate the products of these various CEAP efforts into the ongoing assessment and planning efforts and associated decision tools like the Vulnerability and Assessment Program Performance Tool VAPPT (See Attachment B). At the meeting NRCS staff, responsible for building the VAPPT tool, were able to directly integrate some of the resulting geospatial products developed by Jeff Fore as part of the Missouri River CEAP effort. This direct integration was the first step to successfully demonstrating our ability to incorporate biological endpoints into NRCS program planning and assessment.

Participants of September 18 and 19 Meeting	
NRCS	Michael Golden
	Charlie Rewa
	Lee Norfleet
	Michelle Laur
	Kevin Inghram
	Peter Chen
TNC	Dennis McGrath
	Scott Sowa
University of Missouri	Jeff Fore*

*Note: Jeff Fore is now an employee of The Nature Conservancy

3. If applicable, problems encountered during the performance period, which may interfere with meeting program/project objectives. [List N/A if not applicable]

NA

4. List proposed remedies if problem(s) exist as indicated in item 3. [List N/A if not applicable]

NA

Attachment A. Overall work plan for the Western Lake Erie Basin CEAP effort highlighting TNC's tasks and deliverables (in red).

			Year 1				Year 2				Year 3			
Objectives and Major Tasks	**Lead**	**Deliverable**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Objective 1: Develop fine resolution SWAT models for WLEB														
Complie data to define HRUs (soils, DEM, historic and current land cover) and Subbasins (based on existing or slightly modified NHD-Plus catchments)	ARS PostDoc and Technician	SWAT input data for WLEB	X	X										
Compile READILY AVAILABLE input and calibration data for SWAT model (climate, water quality, flow)	ARS PostDoc and Technician	SWAT calibration data for WLEB	X	X										
Compile spatial data on tiling (incorporate both N and P constituents?) and atrazine application rates	ARS PostDoc and Technician	Additional SWAT input data for WLEB	X	X										
Compile water quality and flow data (e.g., data from OH EPA and Heidelberg Univ) to support the spatially-distributed calibration of the WLEB SWAT model and deliver it to the ARS SWAT Modeling Team	TNC	*Georeferenced point data on nutrient, sediment and flow parameters*	X	X										
Develop modeling subroutine to automate components of calibration process	ARS PostDoc and Technician	SWAT modeling subroutines	X	X	X									
Ensure geospatial identifiers of all stream networks are cross-walked to the common 1:100K NHD Plus network	ARS PostDoc and Technician	Spatially linked stream baselayers across WLEB	X	X	X									
Use SWAT to predict historic and current water quality and flow conditions for stream reaches across WLEB	ARS PostDoc and Technician	Output tables and maps of predicted historic and current water quality and flow metrics for all stream reaches across WLEB	X	X	X	X	X							
Objective 2: Develop models that predict selected riverine biological enpoints based on SWAT output variables and other relevant watershed and local catchment variables														
Compile available biological data (Fish and Inverts) for WLEB and spatially link it to the NHD-Plus	TNC	*Georeferenced fish and macroinvertebrate community metrics*	X	X										
Compile existing data on other watershed and local catchment factors that influence selected biological endpoints	TNC	*Georeferenced watershed and local catchment data pertaining to physiography and land use*	X	X										
Integrate all of the predictor and response variables into a common baselayer: NHD-Plus dataset	TNC and ARS PostDoc and Technician	*NHD-Plus layer for WLEB with related tables of predictor and response attributes that can be joined via the common Reach ID*	X	X	X	X	X							
Use multiple analyses (lines of evidence) to identify ecological thresholds for biological response variables and for isolating relations with SWAT model outputs	OSU PostDoc and Technician	Models that can be used to predict biological metrics					X	X	X	X	X			
Use models to map the predicted current conditions/values of select biological metrics	OSU PostDoc and Technician	Reach scale maps of predicted current values for select biological metrics across WLEB watershed								X	X			

Attachment A. Continued.

Objectives and Major Tasks	Lead	Deliverable	Year 1				Year 2				Year 3			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Objective 3: For priority subwatersheds of WLEB, model and map predicted changes in water quality, flow, and biological endpoints resulting from selected conservation scenarios.														
Select 3-5 priority subwatersheds (~8 digit HUC level) that provide a representative range of land use conditions as well as variation in biological data and conservation practice density.	All, led by TNC	*List of 3-5 priority 8-digit Hydrologic Units agreed upon by project team*				X	X	X						
Use NRCS practice data and expert judgement to select a realistic subset of 10-15 agricultural conservation practices to incorporate into conservation scenarios.	All, led by TNC	*List of 10-15 conservation practices agreed upon by project team*				X	X	X						
Develop sets of 3-5 conservation scenarios for agricultural BMPs (e.g., no BMPs, current level, 50% of watershed, 100% of watershed) that will be applied to the priority subwatersheds using SWAT (ask advisory panel and other key stakeholders for their desired scenarios)	All, led by TNC	*List of 3-5 agreed upon conservation scenarios*				X	X	X						
Use SWAT to model changes in water quality and flow associated with each conservation scenario for each priority subwatershed.	ARS PostDoc and Technician	Output tables of predicted changes in water quality and flow metrics associated with each conservation						X	X	X				
Use SWAT and ecological models to predict changes in biological metrics associated with each conservation scenario in each priority subwatershed	ARS and OSU PostDoc and Technician	Output tables of predicted changes in biological metrics associated with each conservation scenario								X	X	X		
Use GIS to map the changes in water quality, flow, and biological conditions predicted to occur under the various scenarios in each subwatershed.	ARS and OSU PostDoc and Technician	Maps of predicted changes in water quality, flow, and biological metrics associated with each conservation scenario									X	X		
Compare and contrast scenarios within and among the priority subwatersheds focusing on the relations between biological endpoints and the amount of practices.	All, led by TNC	*Report on findings from comparisons*										X	X	
Objective 4: Develop and implement effective communication and collaboration strategies for the WLEB CEAP project														
Develop and participate in WLEB CEAP Advisory Panel	All, led by TNC	*Advisory panel, with supporting purpose statement and its role in guiding the WLEB CEAP effort*	X	X										
WLEB CEAP Advisory Panel Meetings	All, led by TNC	*Advisory Panel meetings at central locations and resulting minutes*		X		X		X		X		X		X
Develop and participate in an expanded National CEAP Team	All, led by NRCS	WLEB CEAP Team, with supporting purpose statement and its role in guiding the WLEB CEAP effort	X											
National expanded CEAP Team Meetings	All, led by NRCS	Combination of remote and face to face WLEB CEAP Team meetings and resulting minutes	X		X		X		X		X		X	
Develop and implment an effective overrarching project management strategy	All, led by TNC	*Project Management Strategy; with objective specific work plans (tasks, deliverables, roles, and timelines) and a project communication strategy*	X	X										
Objective 5: Develop and submit reports and publications														
Develop and submit semiannual and final reports	All*	*Seminannual and final reports*	X	X	X	**X**	X	X	X	**X**	X	X	X	**X**
Develop and submit at least one publication for objectives 1-3 to appropriate peer-reviewed journals	All: Obj 1 led by ARS PostDoc; Obj 2 led by OSU PostDoc; Obj 3 led by OSU PostDoc	3 or more peer-reviewed publications												X

Attachment B

Discussion on the Evolution, Progress, Products, and Future of the Missouri River, Great Lakes, and Western Lake Erie Basin CEAP Efforts

Fostering Integration of the CEAP Cropland and Wildlife Components to Assess and Forecast Benefits of Conservation Practices to Biological Endpoints

USDA, NRCS, Resource Assessment Division Office
Beltsville, MD

September 18-19, 2012

Meeting Objectives:

1) Common understanding of the purpose, evolution, progress, products, and future of the Missouri River, Great Lakes, and Western Lake Erie Basin CEAP Efforts
2) Common understanding of the purpose, evolution, progress and future of the USDA NRCS CEAP
3) Common understanding of TNCs support and vision for CEAP as part of TNCs Great Lakes Project and North American Agriculture Strategy
4) Better understanding of NRCS's VAPPT tool and possible integration of data and assessment tools developed as part of the MO River CEAP.

Agenda

Sept. 18

12:30 (EDT)	Meeting purpose, introductions	Charlie Rewa (NRCS)
12:35	A Discussion of TNCs and USDAs support and vision for CEAP	All
1:00	Overview of MO River, Great Lakes and Western Lake Erie Basin CEAP efforts	Scott Sowa, Jeff Fore
1:30	General Discussion	All
2:00	Deeper dive into Phase 1 and 2 of Great Lakes CEAP (open interactive discussion)	Scott Sowa
2:30	Deeper dive into WLEB CEAP project: Partners, people, objectives, tasks, and **Progress**	Scott Sowa and Charlie Rewa
3:00	Break	

3:15	Deeper dive into the MO River Basin CEAP project monitoring in WLEB	Jeff Fore
3:45	Overview of NRCS VAPPT	Kevin Ingram and Peter Chen
4:15	Discussion of potential integration of MO River CEAP products and VAPPT	All
4:45	Adjourn	

<u>Sept. 19</u>

9:00	Brainstorm opportunities to integrate MO River Basin CEAP project output and VAPPT	Jeff Fore and RAD GIS lab
4:30	Adjourn	